Space Weather Technical Forecast

Issued on Tuesday, 18 June 2024 at 12:25 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Isolated M-class flares (R1-R2 radio blackouts).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with two M-flares observed, including an M2.4 flare at 18/1123 UTC from AR3712 in the southwest and a long-duration M1.3 flare observed from AR3711 at 17/2035 UTC nearer the southwest limb. There are six sunspot regions visible, with AR3712 the most prominent, as a large southern disc spot. A sheared delta configuration is evident, and with ongoing emergence within its intermediate region further complexification is possible. This is the largest of three active regions near the centre disc, while AR3711 one of three small region now approaching the southwest limb, and is also a relatively small and simple regions.

No Earth-directed CMEs have been observed, with all CMEs mentioned on previous forecasts missing, however it is too soon to know if a CME has been released by the M2.4 flare at 18/1123 UTC.

Solar Wind / Geomagnetic Activity: Fast wind influence from CH45/+ was observed, with solar winds at ACE increasing from slightly elevated, at 400 km/s to be elevated at 550-600 km/s from around 18/0000UTC. Density remained near average to just below. Interplanetary Magnetic Field (IMF), Bt, was Moderate at 8-12nT, but eased to be weak from 18/0050 UTC. The north-south component, Bz, was mainly moderately negative at first reaching a minimum -10nT, but became mainly moderately positive from 17/2040 UTC, with peak +9nT. This then eased to be weak and more variable in direction from 18/0300 UTC. Geomagnetic activity has been Quiet to Unsettled (Kp 2-3).

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux observed by GOES18 remained at Background. High energy electron flux (greater than 2MeV) observed by GOES16 was at Background, with the associated 24-hour fluence well below Active. Observed fluence at 18/0000UTC was 9.21e5 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is expected with further M-class flares and a slight chance of X-class flares. These most likely from AR3712.

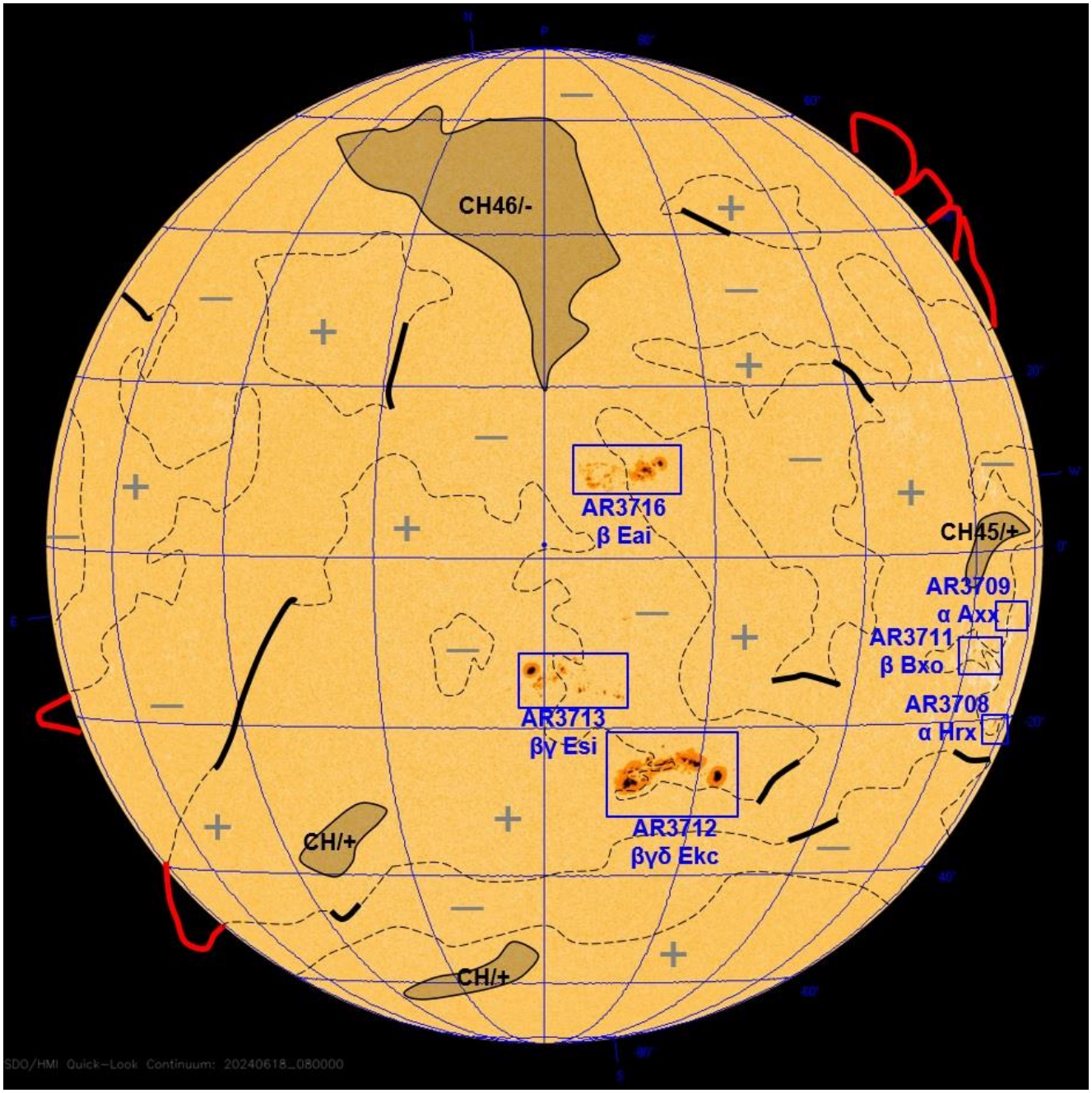
Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. Current fast wind influence from CH45/+ is expected to ease with solar winds gradually easing towards background. There is a chance of a further enhancement later on day 4 (21 Jun), from any influence of CH46/-, however this is low confidence. Mainly Quiet to Unsettled geomagnetic activity is expected. There is a chance of isolated Active intervals with either of the fast wind enhancement, mainly day 1 or later day 4 (18 and 21 Jun).

Energetic Particles / Solar Radiation: High energy proton flux is expected to remain at Background, but with a chance of enhancement given any notable flares, predominately from AR3712, and a slight chance of reaching the S1 Minor Storm threshold. High energy electron flux is forecast to be at predominantly Background, but with a chance of diurnal rises to Moderate, however the associated 24-hour fluence is expected to remain below Active.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Figure 1. Solar Analysis Valid 18/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Geomagnetic Storms:

There are no Earth-directed CMEs, and current elevated solar winds due to CH45/+ are expected to gradually ease towards background through the period.

MOSWOC Enlil is currently suggesting a further enhancement from the large central disc coronal hole CH46/-, peaking by day 4 (21 Jun). This currently considered over-estimated in both strength and southern extent in enlil, with 27-day persistence supporting this, as no significant enhancement was observed on the previous rotation. However, given the slightly more northward location of Earth, a slight increase is considered possible on this rotation, albeit with low confidence, with winds perhaps becoming slightly enhanced by the end of day 4 (21 Jun).

Mainly Quiet to Unsettled geomagnetic activity is expected. There is a chance of isolated Active intervals with either of the fast wind enhancement, mainly day 1 or later day 4 (18 and 21 Jun).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	1	1	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Figure 2a: Enlil model, showing over-estimated influence of CH46

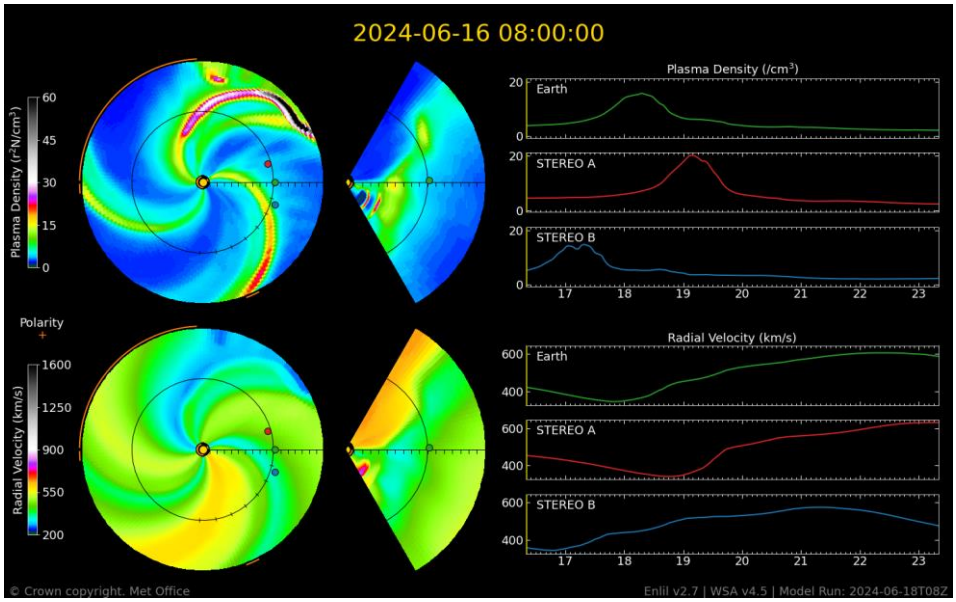


Figure 2b: SDO aia 211, showing last rotation (left) and current (right), with large northern CH visible.

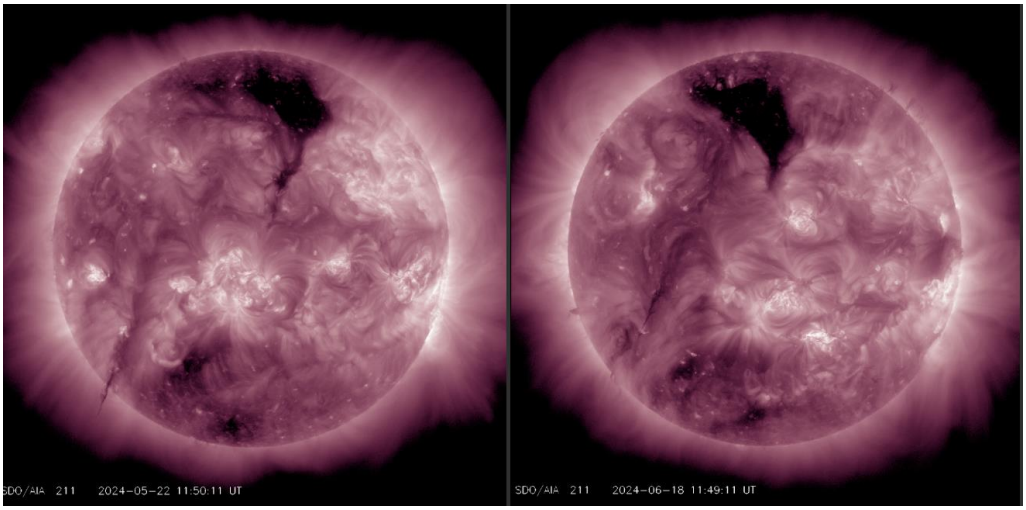
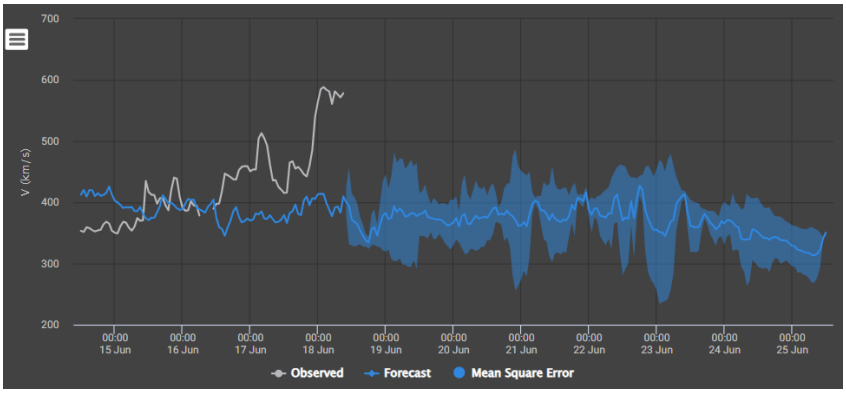


Figure 2c: SWPM showing lack of enhancement last rotation



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Radio Blackouts - X-Ray Flares:

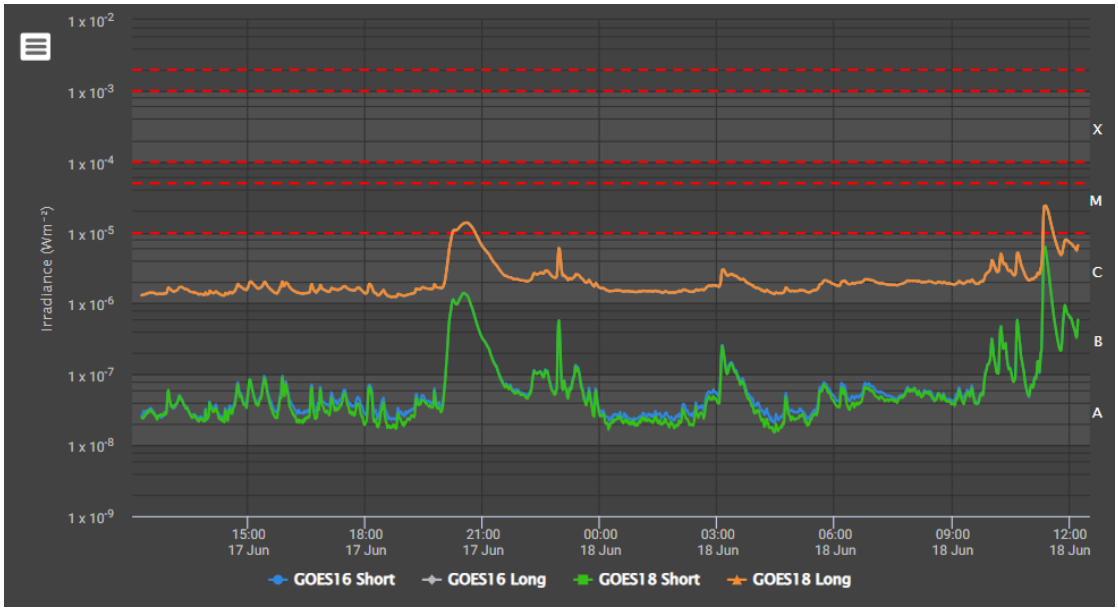
Moderate activity is forecast with an ongoing chance of isolated M-flares, and a slight chance of X-class flares.

There are six sunspot regions currently on the disc, located in two longitudinal clusters. The first is towards the southwest limb with three small spots, along with a surrounding area of plage, which are now becoming hard to observe and analyse, but they all remain relatively simple. This is despite AR3711 within this region being the location of the most recent long period M1.3 flare at 17/2035.

The other cluster is just west of centre disc, consisting of three much larger regions. The most notable is the southernmost, large AR3712, which continues to show some growth within its northern intermediate area, including a sheared delta spot, and is now largely encompassed by a single large penumbra, aside from its leader. The other two regions are moderately sized, with some slow development, but remain relatively inactive and magnetic simple.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	80	75	75	75
Very Active	R3 to R5 X Class	No	20	15	15	15

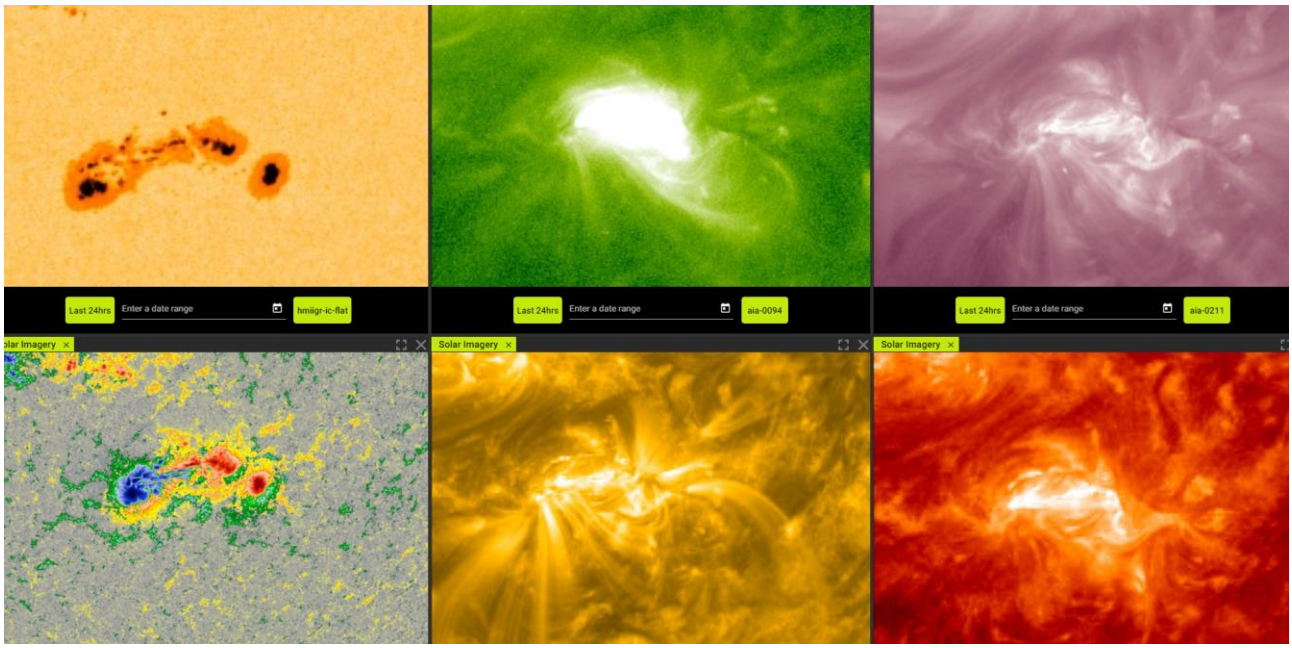
Figure 3a: GOES-16/18 X-ray flux



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Figure 3b: SDO imagery of AR3612



Solar Radiation Storms - (High Energy Protons):

GOES-18 proton flux remains at background, with no solar radiation storms occurring. However, any significant flares, most likely from AR3712, have the potential to increase the observed flux at GOES. This bring a slight chance of reaching the S1 Minor Storm threshold, with this risk increasing slightly as this region moves further onto the western disc.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	10	10	15	15
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

High Energy Electrons Event (≥ 2MeV):

High energy electron flux, as observed by GOES-16, is expected to persist at mainly background levels, perhaps rising a little to Moderate values at diurnal peak as a consequence of the recent fast wind onset from CH45/+.

The associated electron fluence is expected to persist below the Active threshold, perhaps rising a little in response to the recent enhancement. This is supported by MOSWOC REFM which is currently considered to be providing good guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.